

**MANUFACTURING PROCESS FOR A MICROWAVE ANTENNA USING  
WAVEGUIDE TECHNOLOGY**

The invention relates to a manufacturing process for  
5 a microwave corrugated-horn antenna using waveguide  
technology.

This type of antenna is generally made up of several  
molded parts. In particular, for making the  
corrugated horn, the manufacturing process consists  
10 in molding two half-parts that are symmetrical  
relative to an axial plane of the horn. The number of  
molds required for the manufacture of the various  
elements of such an antenna can become prohibitive  
with a view to high-volume, low-cost production.  
15 Moreover, the alignment and interconnection of the  
various elements of the antenna, in order to limit  
the electrical discontinuities, lead to manufacturing  
constraints that impact the production cost of the  
antenna.

20 Figure 1 shows a perspective view of an example of a  
microwave antenna using waveguide technology  
comprising a corrugated horn 1 with, amongst other  
features, a frequency separator 2. The corrugated  
horn 1 is formed by assembly of two symmetrical half-  
25 parts.

The use of blocks of synthetic foam, such as  
polymethacrylimide, for constructing microwave  
devices using waveguide technology is known from the  
document "Foam technology for integration of  
30 microwave 3D functions" - ELECTRONICS LETTERS 14  
October 1999 - Vol.35 N°21. In particular, this  
document proposes the construction of a 3D bandpass  
filter by molding of a block of foam. A manufacturing  
process for a horn antenna, according to the abstract  
35 of the Japanese patent JP-A-59107607, is also known  
that consists in rolling a fiber-reinforced plastic  
into the grooves of a conical mold so as to form a  
corrugated horn whose corrugations are metallized.

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A process for depositing a metallic film onto a block of foam for manufacturing microwave antennas using waveguide technology is also known from the French patent document n°2780319.

5 The aim of the invention is to propose a process for manufacturing, from a block of synthetic foam, a microwave corrugated-horn antenna using waveguide technology, which process is designed for low-cost volume production, but which avoids the drawbacks  
10 indicated above.

The process according to the invention consists in forming the corrugations of the horn on the external surface of a block of synthetic foam and in subsequently metallizing the surface of the conformed  
15 block of foam to form the antenna. With this process, the corrugated horn can be manufactured as a single piece, which will contribute to eliminate the electrical discontinuities in the antenna.

The conformation of the external surface of the block  
20 of foam for forming the corrugations of the horn is preferably obtained by thermoforming according to a hot-press molding technique. The preform of the block of foam used for forming the horn will preferably be substantially conical.

25 The surface metallization of the block of foam is preferably carried out by projection or using a brush, or alternatively by dipping in a metallic bath.

The synthetic material used for the foam will  
30 preferably be a polymethacrylimide foam, marketed under the name of "ROHACELL HF", that exhibits, amongst other advantages, a good compromise between rigidity, low dielectric constant and low losses.

In addition, the external surface of several sections  
35 of the same block of foam can be conformed by hot pressing in a mold in order to form, as a single piece, a microwave antenna comprising, successively, a corrugated horn, an impedance adapter and a polarizer.

## CLAIMS

1. A manufacturing process for a microwave  
5 corrugated-horn antenna (5) using waveguide  
technology, characterized in that it consists in  
forming the corrugations (6) of the horn on the  
external surface of a block of synthetic foam (3) by  
deformation of said external surface and in then  
10 metallizing the surface of the conformed block of  
foam in order to form the antenna.
2. The process as claimed in claim 1, wherein the  
corrugations of the horn are formed by hot pressing  
15 of the block of foam in a mold (4).
3. The process as claimed in claim 1 or 2, wherein  
the metallization of the surface of the block of foam  
is carried out by projection or using a brush, or  
20 alternatively by dipping.
4. The process as claimed in one of claims 1 to 3,  
wherein two radial slots (8, 10) are formed in a  
cylindrical section of the block of foam by  
25 thermoforming and the surface of this section of the  
block of foam is metallized in order to form a  
waveguide polarizer.
5. The process as claimed in one of claims 1 to 4,  
30 wherein a circular groove (12) is formed in another  
section of the block of foam by thermoforming and the  
surface of this other section of the block of foam is  
metallized in order to form an impedance adapter.
- 35 6. A microwave corrugated-horn antenna using  
waveguide technology, characterized in that it is  
formed from a block of synthetic foam having, on its  
external surface, corrugations obtained by

deformation of said surface, said corrugations being metallized.

7. The antenna as claimed in claim 6, characterized  
5 in that it comprises, in addition, a waveguide  
polarizer formed by two radial slots (8, 10) formed  
in a first cylindrical section of the block of foam,  
this first section being metallized.

10 8. The antenna as claimed in either of claims 6 and  
7, characterized in that it comprises, in addition,  
an impedance adapter formed by a circular groove  
formed in a second section of the block of foam, this  
second section being metallized.